In Response

Courseware and Behavioral Instruction: The Design and Dissemination of Effective Teaching Systems

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Chase (1985) has advocated the integration of behavioral instruction techniques with advanced authoring programs to design complex computerized conceptual learning programs. He argues that the development of these complex programs may minimize some of the recent criticisms of behavioral instruction and presumably facilitate the adoption of this technology into the educational mainstream. We wish to point out that behavior analysts have already designed several notable examples of highly conceptual instructional programs (Becker, 1977; Miller & Weaver, 1974; Ross & Semb, 1981). Unfortunately, these demonstrations have had little impact on the dissemination of their related technologies (Greer, 1982; Skinner, 1984). Minimizing criticisms of behavioral instruction may only be a partial solution if our goal is to improve the effectiveness of teachers, trainers, and other professionals through the use of behavioral instruction. Although we agree with the importance of integrating behavioral instruction techniques with computer technology, how computers will be used to promote effective instruction in different settings with different needs and resources is less clear. While Chase's excellent recommendations should be of substantial use to instructional designers, we wish to add several cautions and a few recommendations of our own.

First, to encourage educators to adopt and maintain computer-based instruction, systems should be designed to teach students effectively, to utilize the physical resources of a setting creatively, to provide a cost-effective solution to a real problem, and to minimize increases in the amount of administrative and instructor effort. Designers must carefully analyze the behavior of everyone associated with instructional settings in order to improve or at least maintain the contingencies of reinforcement involved (cf. Fawcett, Mathews, & Fletcher, 1980). Sulzer-Azaroff (1985) recommends that evidence of effective behavioral instruction programs should be "communicated to educators, the public at large, and public policy makers, *and we must study methods to induce their sustained application*" [italics added] (p. 31).

Our second point has a more direct bearing on the utility of interactive software: Despite the burgeoning growth of microcomputers in schools, these institutions still lack the hardware with which to utilize interactive programs effectively. Currently, only one computer exists for every 100 students in our public schools, and this ratio is only expected to improve to 30 students per computer by 1988 (Bonner, 1984). Although some private-sector and university settings have better facilities, many students will

simply not be able to spend a substantial amount of time with interactive computer-assisted instruction. Given these facts, instructional designers should explore computer-managed instruction, computer-based testing, and other ways of maximizing the benefits of the existing (and expected) computer resources in these settings.

One effective strategy might be to examine the components of proven instructional technologies and then attempt to integrate the computer gradually into the existing manual systems. This integration could improve efficiency and effectiveness by increasing student performance gains; reducing instructor development time; lowering costs; helping with the training and management of instructional staff; reducing the time and effort involved with implementing, operating, and revising the instructional system; and by providing rich and frequent reinforcement for the appropriate behaviors of everyone involved.

Instructional designers would be wise to follow the recommendations of Paine and Bellamy (1982) by progressively developing their techniques into demonstration projects and finally into models that could be disseminated in the educational marketplace. Perhaps designers could develop several different versions of a computerized system for settings with differing staff or computer resources. In this way, educators could implement the systems in a wide variety of settings and update the technology as more resources became available.

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